

# **The Guide To Hydroponic Gardening For The Novice**

**How To Grow Great Vegetables Without Soil**

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## DEDICATION

This book is dedicated to my parents, who taught me the importance of learning new things.

# CHAPTER 1- WHAT IS HYDROPONIC GARDENING?

Fans of science fiction, fans of gardening and fans of innovative agriculture have one thing in common. They've all heard of hydroponic gardening. However, just having heard the term only piques your curiosity. What exactly is hydroponics, and how does it work?



## **The Origins of Hydroponics**

The word hydroponics comes from the combination of two Greek words. The first is hydros, which means water. The second is ponos, which means work or labor. While hydroponics sounds like a futuristic term, the roots of the practice are nearly as old as the roots of the word.

The Hanging Gardens of Babylon were thought to operate on hydroponic principles. The gardens were located in an otherwise inhospitable location, so a series of water pulls fed water to the top of the stepped gardens, allowing it to trickle through the plant life and back to the ground. This is, in essence, what hydroponics is: gardening without the use of soil.

In the 10th and 11th centuries, the Aztecs made use of hydroponics in the opposite sort of environment. The marshlands where they lived could not support their crops. Instead, they built rafts that held small portions of soil. The plants that grew from that soil reached their roots into the free water below the raft, drawing all the sustenance they needed to thrive.

## **The Development of Hydroponic Science**

In the middle and late 1620s, Sir Francis Bacon worked on the idea of soil-free gardening. In 1699, further work was done on the concept. John Woodward experimented with the quality of water in which a plant might grow. It was found that water which had been filtered through soil fed plants to a higher degree than filtered or distilled water. This is because of the minerals it retained, though science at the time did not know this.

The term hydroponics was not coined until 1929, when the idea of commercial hydroponics farms began to circulate. It wasn't until 1938 that hydroponics was demonstrated on a large scale, on Wake Island. This island was used as a stopover for Pan-Am Airways. Hydroponic gardens were set up on the island growing various vegetables. These vegetables were used to feed the crew of the airplanes, proving the concept.

### **Why Use Hydroponics?**

Plants have been growing in soil for much of the lifetime of the planet. Why change up the natural order by forcing plants to grow in mineral-infused water instead? There are a few distinct benefits.

Hydroponics is effective in areas where the local climate is inhospitable for food. This includes arid areas such as New Mexico and parts of the Middle East. It also includes overly cold areas, though additional equipment is required to keep the plants warm enough to live

Hydroponics takes up much less space -- a mere 20 percent of what the same crops would require in soil. This makes it ideal for small islands with limited space, as well as dense urban centers with no open soil.

Despite relying on water alone to grow plants, hydroponics systems require 90 percent less water than crops grown in soil, due to water recycling and the self-contained nature of the system

Because of the closed nature of the system, it is much harder for pests to break in and infest the crops. This means a much smaller amount of pesticides and fertilizers are required to grow crops.

Hydroponics allows crops to grow in areas where they otherwise couldn't, which eliminates the need for transportation and importing fresh produce.

Hydroponics allows a plant ready access to water and nutrients, which means it doesn't need to dig deep for those necessities. This drastically cuts down the amount of time it takes to bring a plant from seedling to harvest-ready.

With all of these advantages, why don't we use hydroponics around the world? Unfortunately, the system does have a few drawbacks. Rather than picking a plot of soil, planting seeds and waiting, hydroponics requires a lengthy setup. For large-scale commercial farms, this means a very high introductory cost. While the cost will be made up in profits over a relatively short period, it is still a larger investment than most farms are willing to make.

Hydroponics also requires a constant flow of water to work. Stagnant water will not nourish plants. This means the water needs to be circulated constantly with a system of pumps. If these pumps were to fail, through mechanical problems of power failure, the crops could be ruined.

### **The Future of Hydroponics**

Hydroponics is a fast-growing industry. There is little room in traditional farming for expanded techniques, but hydroponics is far younger with much more room to grow. It is expanding in two directions, commercially and individually. As time passes, hydroponics equipment is becoming easier and cheaper to manufacture, set up and use. This means virtually anyone with space and electricity can set up his or her own hydroponic garden.

On the other end of the scale, research is constantly underway for new methods to reduce the cost of large-scale systems. Many farms are converting some or all of their production to hydroponic systems. Simply take Tokyo for example. Japan has set up large-scale hydroponic rice farms in underground vaults, away from the weather and pests of the surface. Rather than a single annual rice harvest, they manufacture four each year. This increased harvest coupled with the decreased space requirements has proved to be of great benefit to the cramped city.

Hydroponics is a technology that is sure to take off over the coming decades. Food production is in high demand as population rises, and hydroponics may be the only way to meet that demand.



## CHAPTER 2- GETTING STARTED WITH HYDROPONIC GARDENING- SELECTING THE RIGHT SYSTEM

The basic concept of a hydroponic system is a garden enclosed in a small space with running water and very little to no soil. The water carries all of the nutrients the plants need to thrive. Easy access to those nutrients allows the plants to focus more energy on producing fruit or vegetables and less on developing root systems. This results in a faster harvest with more robust produce in a smaller amount of space.

While all hydroponic systems operate on the same principle, there are several different systems you can use. Which one is best for you? The exact answer depends on your space availability and your exact needs. Here are the basic hydroponic systems and how they might fit your needs.

### **Ebb and Flow Systems**

Ebb and flow hydroponics is one of the most common varieties. It works best with small, short plants, such as herbs. These systems work by putting plants in an inert material, called a medium. The plants do not receive nutrients from this medium, and instead use it simply for root support. The bottom of the tray in which the medium and the plants are housed opens on to water access. Periodically, your nutrient solution is pumped upwards into the medium, soaking it and allowing plants access to the nutrients. The pumps are turned off and the water gradually drains, until the cycle repeats.

Pros: Ebb and flow is a simply system to set up and maintain. It requires a small pump, but little in the way of extra parts. It also takes up a relatively small amount of space, making it ideal for gardeners with height restrictions. You can also use any type of medium and your nutrient solution is easily recycled.

Cons: You will likely be unable to grow tall or large plants in the ebb and flow system. You may also run into issues with mineral buildup, necessitating regular cleaning. Without such cleaning, you may find your plants cannot reach the nutrients they need.

### **Nutrient Film Technique**

The NFT style is perhaps the oldest version of hydroponics and operates on a similar principle as the Hanging Gardens of Babylon. It consists of a long, shallow channel or pipe -- modern systems can use PVC -- with regularly spaced holes, baskets or pots of medium. The bottom of these holes opens up into the channel. The channel itself is sloped gently. At the top of the channel, nutrient solution is pumped and allowed to flow. At the bottom of the channel, the solution is collected and cycled through the system again. Plants are placed in the holes, with the roots reaching the nutrient solution.

Pros: The method is proven effective for large plants such as tomatoes and there is no height restriction. Your nutrient solution is recycled easily through the system and you have no need for a growth medium for most plants. Water is constantly flowing, so you don't need to worry about timers or complex controls. NFTs are incredibly easy to set up and operate.

Cons: Small plants may not be able to reach the water and will not thrive in a NFT system. You will also have to monitor the pH of the nutrient solution. These systems are also highly susceptible to damage if the pump fails, as there is no medium to hold extra nutrients.

## **Aeroponics**

As one of the most advanced hydroponic systems developed today, aeroponics is beyond the reach of most household gardeners. It is, however, very useful for large-scale farms and commercial growers. At the bottom of the system is a tray partially filled with nutrient solution; above it is a lattice or tray in which plants are suspended, with their roots able to reach the water below. Above the plants are sprayers that release a mist of nutrient solution over the plants as a whole, which filters to the bottom tray and is recycled for further spraying.

Pros: Aeroponics kits are sold in one piece, making it incredibly easy to set up. It can contain a large number of plants at various heights. It also recycles the nutrient solution used for spraying.

Cons: Sprayers can clog easily, as can pumps, and if the constant flow of water is interrupted for too long, the plants can easily die. You also need to monitor the pH levels of the water carefully. Root disease is common, and the system needs constant monitoring. You definitely cannot set up and forget about an aeroponics system.

## **Drip Systems**

Drip systems are similar to traditional irrigation methods. A single reservoir of nutrient solution feeds into a main water pipe. This pipe has a number of smaller offshoot pipes leading along grow channels. These channels contain soil in traditional farming, but are limited to a static medium for hydroponics. The small pipes often lead directly to the plants that will be irrigated.

Pros: Easy to set up, easy to purchase and easy to get started. Drip systems can be set up in virtually any configuration, meaning oddly shaped spaces can be utilized fully. You are able to set up a drip system on a constant flow or a timed release, and you can choose whether to pump back and recycle the used nutrient solution.

Cons: Requires plenty of space horizontally, though not much vertically. A drip system also works best for small plants, because larger plants may need a higher nutrient flow than the system can provide. They are also time-consuming to set up initially.

# CHAPTER 3- HOW TO SET UP THE HYDROPONIC SYSTEM

In today's challenging economic times, many families are turning to gardening. Gardening can help reduce your grocery budget while improving the health of your family. There are many different types of gardening methods, and hydroponic systems are increasing in popularity.

A hydroponic system is a method of gardening that does not require soil. It takes some time and effort to set up a hydroponic system, but this method of gardening can produce some exciting results.

## Understanding the Basics of Hydroponics

You do not have to be an expert in hydroponics to maintain a successful system. However, it is important to understand the basics of hydroponics and how a hydroponic system works.

Since no soil is present in a hydroponic system, substitute materials are needed to support the root system of your plants. The plants will need constant access to nutrients.

There are several different methods of setting up a hydroponic system, and many advantages to this type of system. Since a hydroponic system needs no soil, plants can be grown successfully even in less than ideal gardening environments and climates. Growers also have more control over their plants in a hydroponic system.



## Determining Your Budget

It is fun to dream of a huge hydroponic system that will grow a wide variety of different plants and vegetables. However, such a large system might not be in your budget.

Before you start planning the specifics of your system, it is important to determine the budget for your project. It is possible to get a hydroponic system functioning with a budget under \$100. You will just need to be creative with the materials and supplies that you purchase.

If your budget is small, do not be discouraged. A basic hydroponic system is a great place to start, and you can always continue to grow and add to your system.

When you are determining your budget, keep in mind that you should see a decrease in your grocery costs once your system is functioning. When you can grow delicious vegetables in your own hydroponic system, you do not need to purchase these items from the costly produce section of your local grocery store.

## **Designing Your Hydroponic System**

Once you have researched hydroponics and set your budget, you are ready for the fun of designing your own hydroponic system. If you have never used hydroponics before, it is best to start with a small, basic system. A large system can quickly become overwhelming for a beginner. It is best to invest a small amount of money until you are sure that you want to stick with a hydroponic system for a long period of time.

There are many different resources and tutorials that can help you design your system. The Internet is a great place to begin your search. There are numerous websites that will take you through the step by step process of designing your system.

When you are in the design process, make sure to factor in the amount of room that you have for your hydroponic system. If you are living in a small apartment with no yard, your space for hydroponics will be limited. Fortunately, a basic hydroponic system can fit even in small spaces.

After you have designed your system, make a list of the items that you need to purchase to turn your idea into reality. If you are working with a tight budget, it is a good idea to check several stores to find the best prices. You can also check online retailers to be sure that you are getting the best deal for your hard-earned dollars.

## **Determining the Success of Your System**

Once your system is up and running, you will be able to see growth and changes in your plants each day. Hydroponics is a process, so you might get the exact results that you want during your first round of hydroponics.

You can determine the success of your system by the health of your plants. If your plants are thriving, then your system is successful. If not, you can make changes to help your system run more smoothly.

## **Troubleshooting Problems**

No hydroponic system will work perfectly all of the time. If you are not getting the desired results from your system, you need to troubleshoot to find out what is causing the problem.

To begin the troubleshooting process, take a careful look at each step of the hydroponic process. Is your plant getting adequate water? Is your plant getting adequate nutrition? If you can answer yes to both of these questions, then continue your search.

It is a good idea to check the pH level of your system. If the pH level is not in the ideal range, your plant will be unable to absorb the valuable nutrients. Thankfully, it is much easier to test pH in a hydroponic system than it is in a traditional garden setting.

If you are unable to determine the root of your problem, ask someone who is experienced in hydroponic systems for help. You can even find complimentary assistance online by visiting forums that bring together people who are passionate about hydroponic gardening.

Setting up your hydroponic system can be a challenging adventure, but it is exciting to see how the system thrives when it is working correctly. Before long, you will be enjoying the results of your labor as you supply your family with fresh vegetables.

## CHAPTER 4- BEST VEGETABLES TO PLANT IN THE HYDROPONIC GARDEN

As you start down the rewarding path of hydroponic gardens, one of the first questions you'll need to consider is what exactly you'll be growing. While nearly everything will grow in this fashion, you may find that some vegetables are more suited to a hydroponic environment than others.

Of course, the type of garden you've constructed will play a big role in determining which vegetables will thrive and which ones won't. Beginner gardeners will likely find it best to start simple. A raft system, for instance, is often recommended for beginners due to its simplicity, low cost, and faster rate of growth. Find vegetables that will thrive in a wet environment and remain small enough to fit on the raft. Want some more specifics? Here are some of the best vegetables to plant in the hydroponic garden.

### **Spinach**

Spinach and other leafy greens tend to grow exceptionally well in a hydroponic garden and they make a wonderful choice for beginners. With spinach specifically, many growers find they can eliminate some of the grit that often accompanies ground-grown varieties. But don't feel as though you must limit yourself to spinach. Kale, watercress, and mustard greens are but a sampling of the leafy greens that should grow well in your setup. When they have reached maturity, you can choose to harvest the whole plant at once or just cut a bit off, leaving the rest to grow. One word of warning, however: don't let your leafy greens get too big without trimming them back. These vegetables may choke on the lack of available space, leading to the early demise of your garden.



### **Lettuce**

Many gardeners believe that lettuce is the best vegetable for growing hydroponically. It is especially appropriate for beginners as it can handle some degree of error and doesn't require a great deal of special attention. As the plant grows, you can begin to harvest the outermost leaves. In this way, the plant can continue to supply fresh, crisp

lettuce leaves for many months. The inner leaves will quickly grow to replace the outer leaves you've harvested. Whether you prefer Romaine, butterhead, or iceberg varieties, they should thrive in your hydroponic environment. Can't decide? Go ahead and plant a few types and you'll have some options for future salads.

## **Cucumbers**

If you're a fan of cucumbers, you can add them to your hydroponic garden without reservation. While bush cucumbers will need some physical support as they grow, lest they begin to tip over, miniature varieties that have been bred for container growing can work very well in a raft system. Of course, if you have the space and the dedication, there's no reason why any cucumber cultivar shouldn't work. Remember, a hydroponic environment can lead to faster growth than you may be used to. Don't forget to check on your cucumbers regularly in case they need attention.

## **Feed the Family**

Of course, you must take your tastes into consideration when deciding what to plant in your garden. Talk to your family and let them in on the process. Growing a crop of lettuce may be easy enough to do, but if no one in your family enjoys lettuce, what was all the work for? At the same time, don't rule out vegetables you've decided you don't like based on their supermarket examples. A fresh garden produces vegetables that are a far cry from what's commercially available. In some cases, the taste difference may be so stark that you find new favorites. Be adventurous when choosing your crops, but you may get more support from your family if you at least pay lip service to their preferred vegetables.

## **Efficient Use of Space**

Most beginners will start out relatively small. There's no reason, after all, to spend hundreds of dollars on an advanced setup when you aren't sure whether this is a hobby that will retain your interest. Since you probably have your eye on a small system, choose vegetables that will make efficient use of space. The aforementioned examples are but a few of the vegetables that can thrive in a hydroponic system while leaving you some room.

## **Herbs**

Herbs may only be vegetables by association, but they can make a lovely addition to any hydroponic garden. Keep in mind that herbs tend to grow slowly in such an environment, so don't be surprised if you need to wait a few months for a mature leaf. Once that happens, though, you should have an inexhaustible supply of fresh garden herbs for the next year. Herbs need high light and a warmer climate, so keep your environment in the 70s for best results.

## **General Tips**

Remember, many of the same principles that apply to outdoor growing will still be applicable to a hydroponic garden. For instance, vegetables that thrive in cool environments will need the same when grown indoors. All vegetables will require a great deal of light to grow properly, so make sure you buy the right lights for your setup. You may find it easier to plant crops that share many of the same needs. Splitting climate needs and buying multiple-spectrum lights can quickly grow expensive.

## **The Worst Vegetables**

As stated, most vegetables will grow well in a hydroponic garden if given the proper attention. That said, some are more easily grown than others. If you're just starting out, avoid crops such as corn, melons, summer squash, and potatoes. These can grow well in such an environment, but they take up a lot of space and their quality may not differ substantially from their commercially grown contemporaries.



## CHAPTER 5- HOW TO PLANT SEEDS IN THE HYDROPONIC GARDEN

For the gardener who is looking to advance his or her skills, hydroponic gardens are a wonderful way to grow plants without wasting water, soil, and other resources. You may have read extensively on how to set up your tank, filters, and water supply, but have you considered the seeds? Can you just pop them into your hydroponic gardening system, or do they have to be nurtured elsewhere first? Here is a guide to planting seeds in your hydroponic garden.

### The Seeds

Your seeds do not necessarily have to be suited for a hydroponic gardening system. However, some seed varieties will grow better in hydroponic gardens than others will. Find several seed catalogues and browse through them to see what you would like to grow. As you are browsing, look for varieties that are self-pollinating and greenhouse friendly.

Some good vegetables and plants to use in your hydroponic garden include roses, tulips, other cut flowers, green leafy vegetables like cabbage and lettuce, tomatoes, peppers, beans, and eggplants. Very few plants and crops are not suited for a hydroponic garden. For example, you will not have much luck with root vegetables like potatoes and carrots, as these crops need sandy soil in which to grow. Aside from that, the only limit you have is your own willpower.



### Planting

One way to start growing in your hydroponic garden is by transplanting seedlings from organic material-filled pots into your hydroponic system. Most of these are not filled with soil, as you are supposed to transplant the seedling directly into your tank. Filling the tank with soil will destroy your pump as well as introduce contaminants into your hydroponic garden! Instead, choose specialty starter plugs made of rockwool in which to grow your seedlings. They have holes placed into them for the seeds, which makes at least one part of hydroponic gardening pretty easy! These starter plugs are widely available on the market and the seedlings can gently be moved over to the main hydroponic system from the plugs when the time is right.

Start by purchasing your plugs, seeds, and a nursery tray. There are specialty nursery trays that you can use, but you can opt for cheaper trays if you are on a budget. The main thing you need to worry about is sufficient lighting for your seedlings to grow properly. You will want to keep the tray in a warm, well-lit spot, but make sure that it is not too hot, or the seeds will die. Try to keep the temperature to 65 to 80 degrees Fahrenheit (18 to 26 degrees Celsius). A fluorescent grow-light that is close to the plants but is not too hot will ensure that the seedlings grow straight and strong.

Take the starter plugs and use just enough water to moisten them. Use one or two seeds for each cube if you are growing vegetables or flowers, and about six seeds to a cube if you are growing herbs. Make a few more cubes than you need as a backup plan in case some of the seedlings die. Put the cubes in the nursery tray and set up your lighting, or place the tray in a sunny area that is warm but not hot. You will need to water the seedlings every day with a mixture of plant food and water. Within a few days, the seedlings will be sprouting through the surface of the cubes. As they grow, thin out the weak seedlings so that the stronger, healthier ones have more room.

Transplanting the seedlings from the cubes to your hydroponic garden will depend on a number of factors. For most plants, you should wait until the seedlings are two to three inches tall, have roots pushing through the sides of the starter cube, and look hardy enough to transfer. This can take about two weeks. Some plants and crops will take longer.

When you are ready to transfer, rinse the seedlings very carefully in clean, room temperature water. As you are moving the seedlings into the bed of the tank, you need to be very careful. Too much jostling and irritation can kill the roots, thus destroying the plant. Clearly mark where each seedling plant has been placed in the bed so that you do not accidentally place seedlings on top of each other.

You can use a net pot in the bed of the tank if you are worried about the delicate seedling roots. In addition, it is important to remember that your plants will need natural light in order to grow properly. It is recommended that you install your hydroponic garden in an area that gets a lot of sunlight. Whether this is indoors or outdoors does not matter, so long as there is sufficient light and a constant air temperature.

### **The Waiting Game**

Just soil gardens, hydroponic gardens require time to grow as well as patience on the part of the gardener. You will need to check the pH of the water every day to ensure that the plants will grow successfully. As your seedlings begin to develop into fully-formed plants, they can really outshine soil-based crops and flowers. As long as you continue to care for the hydroponic system as time goes on, your plants will be healthy, vibrant, and less costly to the earth. So get out to your backyard and start growing your own plants and produce today!

## CHAPTER 6- HOW TO MAINTAIN THE HYDROPONIC GARDEN

A nice variety of vegetables may be grown within a hydroponic garden, and keeping such a garden is a terrific way to avoid dealing with the pesticides and other contaminants that impact many commercial farms. A hydroponic garden requires a careful balance of nutrients and hydration, and maintaining the garden does require vigilance regarding items such as the water quality and its pH level.

An immense number of different types of vegetables may be grown hydroponically including artichokes, cabbages, leeks, potatoes, asparagus, and squash, in addition to many others. Hydroponically grown fruit also offers healthy options with the opportunity to grow fruits like cantaloupes, strawberries, and even grapes. Just like growing vegetables in a garden outside, hydroponically grown food requires light, water, and nutrients for healthy growth.

Essential items with which a hydroponic gardener must maintain include:

### **Growing Medium**

The growing medium helps to ensure that all of the nutrients added to the water are properly fed into the root system of the plants. In addition, the growing medium will also support the plants. Some types of mediums include clay aggregates and expanded shale. Alternatively, vermiculite is a popular growing medium as is specially constituted sand. Each medium accepts and distributes nutrients and water with different efficiency and awareness of those different behaviors will guide the schedule for watering and applying fertilizer.

Tip: There are an incredibly large number of potential growing mediums for hydroponic gardens. The best choice of medium will likely depend upon the type of plants grown.



### **Nutrient Solution**

A nutrient solution for a hydroponic garden is equivalent to traditional fertilizer used in regular growing conditions. There are solutions available for purchase that are made of different chemical make-ups and require a different amount of maintenance from the gardener. Natural or "organic" solutions are best for hydroponic gardeners who can pay a lot of attention to the garden while chemical solutions will require less work for keeping the garden in good shape.

Tip: Different plants require different nutrients. Determine nutrient concentration based upon the type of plants being grown. Different types of solutions may be necessary for the best growth potential.

## **pH**

Many gardeners who use soil for growing don't pay attention to the pH levels, but doing so with a hydroponic garden is necessary to ensure that the proper nutrients are being added to the garden at the right time. The garden is best kept at a pH level of 6.3; however, slight variations from this level are acceptable. Testing the pH is a simple process for a hydroponic gardener and is accomplished with a kit available anywhere gardening products are sold.

In addition to these necessary components, which will require replacement and maintenance over time, a hydroponic garden must also be cared for much in the same way a regular garden might with watering and pest control. In addition, care may require the rinsing of the tanks used to hold the growing medium and nutrient solution.

A recommended list of projects and general care for a hydroponic garden will include the following:

## **Watering**

One of the common problems that gardeners experience with traditionally grown vegetables and fruits is the inability to determine when and how to water the plants. The rate at which the garden must be watered will depend on the hydration needs of the plants and the type of growing medium used. In addition, the size of the plants may influence the hydration schedule since larger plants need more water. Finding the best rate for watering might take a little experimentation. If the plants begin to wilt, an increase in watering frequency may be necessary.

Tip: Do not add tap water to a hydroponic garden. If no other source of water may be used, allow the water to sit for a few days before applying it to the plants. Agitating the water (shaking it) also helps to reduce chlorine levels faster.

## **Pest Control**

Although it might seem impossible that a hydroponic garden would have problems with pests, sometimes pests such as aphids, spider mites, and whiteflies will infest the garden and require special efforts at pest control be used. There are several organic pest control products available that are best for hydroponic gardens, and many modern solutions are specially designed to kill pests and allow beneficial insects to survive. Alternatively, there are a number of environmentally friendly bugs that are beneficial because they eat pests that destroy plants or make a plant inedible to pests (but not humans).

## **Container Maintenance**

There are a few different types of hydroponic systems such as water culture, ebb and flow, and multi-flow. Each of these systems requires a reservoir of water be maintained. Cleaning the tank associated with the hydroponic system is an essential task to reduce the buildup of mineral deposits over time and ensure a clean environment. Algae growth may also occur if there is too much light that reaches the water directly, so the reservoir should be protected from light to inhibit algae growth.

A hydroponic garden is an excellent answer for anyone who wishes to grow a garden and doesn't have access to a nice patch of ground outside a residence. Hydroponic gardens may be placed almost anywhere and will even allow a gardener to plant and grow healthy vegetables during any season of the year. This means local, naturally grown vegetables are available even when there's a foot of snow on the ground outside.

## CHAPTER 7- DEALING WITH PESTS IN THE HYDROPONIC GARDEN

One of the first steps in dealing with pest in your hydroponic garden is being able to identify them. An effective way of doing this is to use a magnifying glass. You can locate them, pick them off and kill them, and be fairly effective in controlling them. This is only effective if done on a daily basis.

There are times, however, when the infestation is too large for this type of treatment. This is the point where you wish you had taken preventative measures to begin with.

Hydroponic gardens do not have the luxury of getting help from Mother Nature. Outdoor gardens get the help of wind and rain. While a hydroponic garden is isolated from most of the creatures on the outside, because there are so many plants all packed into such a small space, whatever infestation occurs can spread at an overwhelming rate.

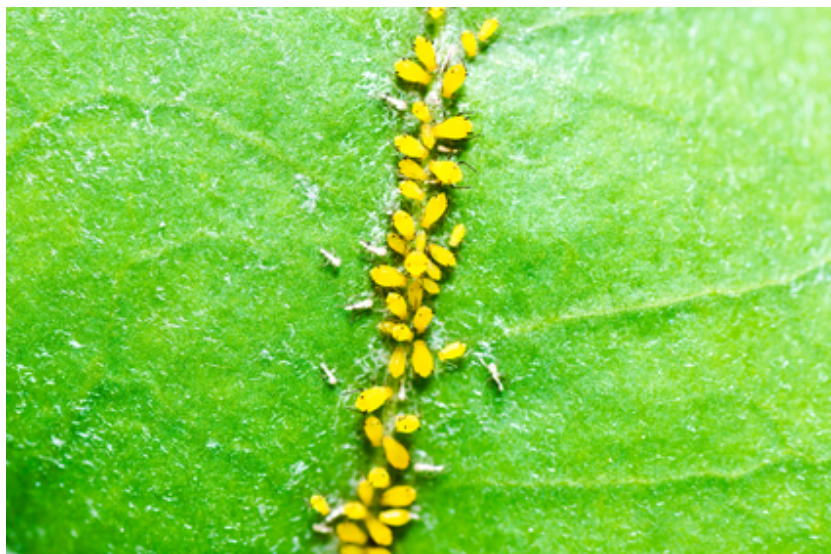
This is what makes prevention such a 'must-do' in the world of hydroponic gardening. Cleanliness is your greatest ally in the fight for a healthy hydroponic garden. Most any commercial hydroponic greenhouse you see follows very strict measures for keeping it clean and pest-free. This involves wearing protective clothing as well as using shoe treatment mats.

Some good rules to follow for keeping a hydroponic garden clean and pest-free are to-

Thoroughly wash your hands. This also needs to be done when going from one crop to another.

Remove all the dead leaves and any plant debris. Always clean up any spilled nutrients or scattered plant media. Diseases and pests actually thrive on scattered decaying plant matter. Remove dying or dead plants and take them outside.

Take care to disinfect any type of tools you may use with alcohol or bleach.



**Proper Growing Conditions:**

Another way of combating pests is to maintain proper growing conditions. This will go a long way toward ensuring a healthy hydroponic garden. It is conducive to producing strong and vigorous plants that are more pest-resistant. You should -

**Keep Humidity Low** - This should be kept at around 50 to 60 percent when possible. It should also remain under 75 degrees and cool.

**Avoid Over-Watering** - When the media is too soggy it leads to mold and mildew as well as algae formation.

The air must be properly ventilated to keep out the formation of mold and fungus.

**Take Care How You Enter** - You should tend to any outdoor gardening you have last. Never go into the hydroponic garden after visiting a compost pile or working with any outdoor crops.

**No Smoking** - Never smoke in your grow room. A smoker should always thoroughly wash their hands with soap before touching any hydro plants. This still might not be enough to stop the spread of the deadly 'tobacco mosaic virus' known to kill heirloom tomatoes.

**Cross-Lighting** - Never bring in outside plants to share in the grow-lights of your hydro plants. Soil-planted specimens can contaminate them.

### **Biological Controls:**

The most effective method overall, for controlling pests in your hydroponic garden is to utilize 'beneficial predators'. This method is tried and true. It can be used anywhere outside of the home. You would not want to turn loose 1,000 ladybugs in your house.

This method is simple and very effective. It is a case of matching up the right predator for the right pest. You can actually mail-order specific bugs from hydro supply sites. One great benefit to this method is that it is chemical-free. Mother Nature knows how to handle these problems. These bugs are totally harmless to you, and usually disappear once all the 'prey' is gone from your garden.

You may have heard of this being referred to as 'IPM' which stands for 'Integrated Pest Management'. This method is especially good when you have a really large infestation. The 'good bugs' can literally eat up thousands of the 'bad bugs'. The main thing is to have them hatched out and working before the garden succumbs to the bad bugs.

Again, identification is essential. Identify the culprits so you can match the appropriate predator and get rid of it. These bugs can be ordered from a wide variety of garden supply websites under the title of 'beneficial insects'. They may be labeled as 'Whitefly Parasites' or 'Aphid Predators' or something similar. When using this method refrain from using any pesticides because they can kill out your 'good bugs'.

### **Organic Pesticides:**

If you find you have begun the predator bug method too late, and you are being overtaken by bad bugs, you may have to resort to using organic pesticides.

One great advantage to hydroponic gardening is producing pesticide-free organic produce. No harmful chemicals. It might be a bit discouraging to have to resort to using pesticides. However, using a relatively safe and organic pesticide is better than losing your entire garden.

Today you can find some fairly good benign sprays that will help you kill the bugs like you need to. Using them properly will ensure that they break down quickly without leaving any harmful chemical residues to stain your crops.

When using organic pesticides on your hydroponic garden, always read the directions carefully and follow them exactly. Be sure to treat each and every speck of your plant surfaces, both the upper and lower leaf portions. Because these agents do not leave a toxic residue, they have to come into direct contact with a bug to kill it.

The best time to apply these pesticides is at night when the lights are out. You don't want to cook your plants. Be sure to stop spraying at least one full week before harvesting, and then wash the produce well before you eat it.

Again, this is a last resort before losing your entire garden. The other methods are very effective. Preventative maintenance is always the best and saves lots of headaches down the road.



## ABOUT THE AUTHOR

Nathaniel Cross grew up on a farm and loves the thought of living off the land. When he grew older he had the intention of becoming a farmer like his dad and selected courses that would help him to be a better farmer as he already had the hands on knowledge and need some more business skills.

It was while he was at school that he was introduced to hydroponics. It was a bit weird to him at first but he decided to learn all that he could about it with the intention of introducing his father to it. With this type of gardening they would be able to grow crops all through the winter to supply the family and other members in the community.

When he introduced his dad to the process, he was encouraged to speak to others who were farmers or did a bit of gardening as well. From that point on he got the idea to write a book to reach more interested individuals.